

**WHAT IS CLAIMED IS:**

1. A process for introducing structures into a substrate, wherein the structures contain a set of deep structures and a set of shallow structures, comprising:
  - depositing on the substrate a layer stack comprising at least two layers each containing a different material;
  - depositing a photosensitive layer on the top layer of the layer stack;
  - patterning the photosensitive layer in a lithographic process using a mask containing a set of smaller and a set of larger features;
  - developing the photosensitive layer, wherein a set of larger patterned features and a set of smaller patterned features are formed in the photosensitive layer;
  - transferring the pattern in the photosensitive layer into a first layer of the layer stack residing beneath the photosensitive layer, wherein a set of smaller and a set of larger openings are formed; and
  - etching a second layer of the layer stack beneath the first layer, wherein the second layer is completely etched down to a third layer at locations corresponding to the larger openings, and wherein the second layer is only partially etched at locations corresponding to the smaller openings.
2. The process of claim 1, wherein the third layer is the substrate.
3. The process of claim 2, wherein the set of larger openings are used to form the set of deep structures and the set of smaller openings are used to form the shallow structures.
4. The process of claim 3, further comprising:

selectively etching the substrate down to a desired depth of the deep structures; and  
etching the second layer, wherein the second layer is completely etched down to the  
substrate at locations corresponding to both the larger and smaller openings.

5. The process of claim 4, further comprising:

selectively etching the substrate down to a desired depth of the shallow structures.

6. The process of claim 4, further comprising:

depositing a blanket layer of a photosensitive material on the patterned openings;

removing the photosensitive material down to a level below the surface of the substrate;

and

selectively etching the substrate down to the desired depth of the shallow structures.

7. The process of claim 4, wherein an etching process used to etch the second layer  
produces inclined sidewalls.

8. The process of claim 7, wherein a slope angle  $\alpha$  between the inclined sidewalls  
and a horizontal is defined by selected etching process parameters.

9. The process of claim 7, wherein, given a predetermined width  $CD_1$  of the shallow  
structure in the substrate, and a predetermined slope angle  $\alpha$ , a thickness  $h$  of the second layer is  
calculated according to  $h = (1+x)^{1/2} CD_1 \tan\alpha$ , wherein the value of  $x$  ranges from about 0 to  
about 1.

10. The process of claim 9, wherein the deep structures in the substrate are formed from features in the first layer with a width  $CD_3 = CD_2 + (1+x) CD_1$ , wherein  $CD_2$  is a predetermined width for the deep structures in the substrate.

11. The process of claim 1, wherein the etching of the second layer is performed using an etching process whose etching rate is dependent on the ratio of the depth to the width of the structure.

12. The process of claim 1, wherein the layer stack comprises a sequence of  $SiO_2$ , polysilicon, and  $SiO_2$  layers.

13. The process of claim 1, wherein the set of larger and the set of smaller features in the mask includes features for the introduction of contact holes and interconnects into the substrate.

14. A mask for forming a set of deep structures and a set of shallow structures in a substrate, comprising:

a first set of larger features for forming the deep structures;

a second set of smaller features for forming the shallower structures, wherein the deeper structures and the shallower structures are formed using the mask in a single lithography patterning step.

15. The mask of claim 14, wherein the first set and second set of features are arranged to produce a set of related and self-aligned structures within the substrate.

16. The mask of claim 15, wherein the first set of features is designed to form contact holes and the second set of features is designed to form interconnects.

17. The process of claim 15, wherein the set of larger features are defined by having at least one lateral dimension greater than at least one lateral dimension of the set of smaller features.

18. A process for producing self-aligned contact holes and interconnects using a single lithography mask level, comprising:

depositing a photoresist layer on a substrate containing a layer stack deposited thereon for formation of the contact holes and interconnects;

exposing the photoresist layer using a mask containing a set of features for forming the contact holes and a set of features for forming connects;

developing the resist layer, wherein a pattern containing a set of larger features and a set of smaller features is formed;

etching a first layer of the layer stack residing beneath the photosensitive layer, wherein a set of smaller and a set of larger openings exposing a second layer underneath the first layer are formed;

etching the second layer of the layer stack beneath the first layer, wherein the second layer is completely etched down to a third layer at locations corresponding to the larger

openings, and wherein the second layer is only partially etched at locations corresponding to the smaller openings;

selectively etching the substrate down to a desired depth of the deep structures;

etching the second layer, wherein the second layer is completely etched down to the substrate at locations corresponding to both the larger and smaller openings; and

selectively etching the substrate down to a desired depth of the shallow structures.

19. The process of claim 18, wherein the shallower structures are for interconnects and the deeper structures are for contact holes.

20. The process of claim 18, further comprising:

depositing a metallic material in the smaller and larger structures; and

removing excess metal not residing substantially within the smaller and larger structures.